

Flow-of-Funds Based National Accounting: An Experimental Application to the U.S. Economy

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Abstract

The objective of this paper is twofold: (i) to design a flow-of-funds based national accounting system, an equivalent of cash-flow statement in business accounting; and (ii) to make from-whom-to-whom flow-of-funds matrix for the U.S. to find out if there were structural changes in the first decade of the century. The matrix is tentatively derived from the Integrated Macroeconomic Accounts by removing the imputations that do not involve payment of funds. We found that there was a conspicuous structural change between 2008 and 2010 when the subprime mortgage crisis hit the economy; and the dominant factor was the shift in monetary policy. Our conclusion is that the economy is highly susceptible to both Federal Reserve's supply of funds and its portfolio.

JEL Classification: C82, E16, E51 Keywords: Flow of Funds; Payment Statistics; Subprime Mortgage Crisis

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1. Introduction

In April 2009, in the midst of the financial crisis and global recession triggered by the collapse of the U.S. housing bubble, the Group of Twenty (G-20) finance ministers and central bank governors called for exploration of information gaps and provision of appropriate proposals for strengthening data collection. As has been true of previous international financial crises, these gaps are highlighted when a lack of timely, accurate information hinders the ability of policy makers and market participants to develop effective responses. The subprime mortgage crisis has reaffirmed an old lesson — good data and good analysis are the lifeblood of effective surveillance and policy responses at both the national and international levels. In response to the G-20 initiative, Financial Stability Board and International Monetary Fund (2009) recommended to develop a strategy to promote the compilation and dissemination of the balance sheet approach, flow of funds, and sectoral data more generally¹.

Following the tradition of Ricardo (1816), who was the first scholar to distinguish funds from the more general term of money, many authors used this term but it was the early-twentieth-century U.S. scholars such as Taussig (1911), Davenport (1913) and Moulton (1918) who systematically discussed the special features of funds². It is well known that it was Copeland (1947) who systematically drew the ground design of the money flows accounts, or flow of funds accounts³ as we now call it. In order not to repeat the bitter experience of the Great Depression that was preceded by the collapse of the financial bubble of the 1920s, which is commonly known as the Roaring Twenties,

¹ From-whom-to-whom framework of presentation is recommended in both Bank for International Settlements et al. (2010) and IMF's Shrestha, Mink and Fassler (2012).

² See Tsujimura and Tsujimura (2012) for further details.

³ The name 'flow of funds' is attributable to Board of Governors of the Federal Reserve System (1955).

Copeland (1949) urged a better understanding of the circulation of funds in the macro economy. Copeland's significant but less recognized role is his contribution to the development of national accounting (Dawson (1991), p.93).

Kuznets' (1937) national income accounts was based on the macroeconomic identity between production, distribution and consumption of goods and services. Copland's system of money flows accounts was based on the payer-payee relationship between institutional units, and rests on legal foundations — on the law of property, of contract and negotiable instruments (Copeland (1952), p.212). Kuznets' system was referred to as commodity-flow method, and Copeland's system as money-flow method of national accounting; more recently, the national accounting based on the input-output accounts is known as product-flow method, and the system based on the national balance sheets is referred to as funds-flow method respectively. Unfortunately, Copeland and his contemporary authors such as Van Cleeff (1941), Stone (1945) and Derksen (1946) did not explicitly define the fundamental concepts of funds-flow method of national accounting because they just borrowed the idea from the business accounting of the time. Moreover, the present-day Flow of Funds Accounts (also known as Financial Accounts), as a result of the drastic remodeling by the Fed in the 1950s, covers only the lenderborrower (or creditor-debtor) relationship rather than the more general payer-payee relationship.

The objective of this paper is twofold: (i) to design a flow-of-funds based national accounting system, an equivalent of cash-flow statement in business accounting, and (ii) to make from-whom-to-whom flow-of-funds matrix for the U.S. to find out if there were structural changes in the first decade of the century, specifically before and after the subprime mortgage crisis. The next section discusses the fundamental concepts of flow-

of-funds based national accounting system. In the latter half of the paper, we will show the procedure to convert the T-shaped balance statements into flow-of-funds matrices and the framework of the structural decomposition. We will use the flow-of-funds matrix, which is tentatively derived from the Integrated Macroeconomic Accounts for the United States supplemented by Annual Input-Output Accounts and Economic Census, to examine the structure of the economy between the years of 1998 and 2011. We found that there was a conspicuous structural change in the U.S. economy during the years between 2008 and 2010 when the subprime mortgage crisis hit the economy; and the dominant factor was the shift in monetary policy. Our conclusion is that the economy is highly susceptible to both Federal Reserve's supply of funds and its portfolio.

2. Flow-of-funds Method of National Accounting

2.1 National Balance Sheets

National balance sheets, which is an essential part of a flow-of-funds based national accounting system, consist of a coherent set of articulated balance sheets of various institutional units or groups of them, which are referred to as institutional sectors⁴. A balance sheet is a list of outstanding claims that relates to *jus in rem*, as well as the claims and obligations that relate to *jus in personam*⁵. *Jus in rem* is the exclusive dominion of a person over a *res* or thing. Apparently, not all *res* is subject to *jus in rem* because the nature of some *res* does not allow exclusive dominion over it. *Res* can be either *res corporales* or *res incorporales*. While *res corporales* are physical objects such as automobile, building, land, etc., *res incorporales* are abstract things such as writing,

⁴ For details, see Section 4.1 below.

⁵ Since most of the English speaking countries have common law system, there are no exact English counterparts for Roman law terminologies.

music, method of manufacture, etc. Although *jus in rem* is considered to be an implicit contract among people *en masse*, the duties that correlate with it are always negative; they merely are duties to forbear or abstain. In contrast to this, *jus in personam* or *obligatio* to be precise is an explicit agreement between specific parties, in which one party is obliged to do or to perform some specific duties on behalf of the other.

Although a bank deposit account belongs to one specific customer and is not transferable, the value stored in it is transferable between deposit accounts; the value in this sense is referred to as funds. Funds and corresponding liability that arise form *jus in personam* are referred to as pecuniary asset and liability respectively on the balance sheet. Although it arises from *jus in personam*, funds are often treated as if they were *res incorporales* because it is almost impossible to identify the issuing bank once they leave the account in which the funds are created. Specific claims and duties relating to *jus in personam*, which are created as a consequence of transmission of funds, are categorized as financial assets and liabilities. A claim relating to *jus in rem*, which has been exchanged for funds, is referred to as non-financial asset. The assets are customarily recorded on the left-hand side while the liabilities are entered on the right-hand side of the balance sheet. The asset and liability relating to the same *jus in personam* are recording of the asset and liability relating to the same *jus in personam* in two different units' balance sheets as a pair is often referred to as horizontal double entry.

2.2 Economic Transactions

We define an economic event as an event that accompanies changes in any of the balance sheets of the institutional units. Most economic events involve two institutional units, typically a payer and payee; Aukrust (1966) referred to the economic events that involve payments of funds as economic transactions. Since the system of flow-of-funds based national accounting is an equivalent of cash-flow statement in business accounting, we record economic transactions at the amount of funds that has changed hands at the moment when the funds are transferred; it is referred to as cash-basis historical-cost accounting. All the economic transactions are supposed to be recorded in a journal in the order of occurrence; then they are grouped by accounting period, institutional sector, transaction category, etc. and posted into the flow-of-funds matrix as well as in the Tshaped current and accumulation accounts. Since Fra Luca Pacioli (1494) who was the pioneer of double entry book keeping was a mathematician, the modern accounting system is no stranger to the mathematical world. In more recent years, Aukrust (1955), Mattessich (1964, 1970) and Ijiri (1967) attempted to axiomatize accounting and successfully introduced set theory as the logical expression.

Let $e[\omega_e, a_e, b_e] \in E$ be any economic transaction, which is characterized by time of occurrence $\omega_e \in \Omega$ and two participants, payer and payee $a_e, b_e \in H$ $(a_e \neq b_e)$; where E is the set of all the economic transactions that have taken place in the past, Ω is the set of time, H is the set of all institutional units. We further define institutional sectors as subsets $S_1, \dots, S_t, \dots, S_m \in H$, where $S_t \cap S_\eta = \emptyset$ (for all $t \neq \eta$) and $\bigcup_i S_i = H$ ($i = 1, \dots, t, \dots, m$) (i.e. the union of all institutional-sector subsets equals to H). In other words, each institutional unit in the economy belongs to one and only one institutional sector. Let ω_0 be the origin of time axis Ω , and $\Delta \omega$ be the duration of an accounting period so that we can define $\omega_{\tau} = \left\{ \left. \boldsymbol{\omega} \in \Omega \right| \left. \boldsymbol{\omega}_{0} + (\tau - 1) \Delta \boldsymbol{\omega} < \boldsymbol{\omega} \le \boldsymbol{\omega}_{0} + \tau \Delta \boldsymbol{\omega} \right\} \text{ as accounting period } \tau. \text{ Economic transactions will be classified into categories } \mathbf{K}_{1}, \cdots, \mathbf{K}_{\kappa}, \cdots \mathbf{K}_{n} \in \mathbf{E} \text{ as needed, where } \mathbf{K}_{\kappa} \cap \mathbf{K}_{\lambda} = \boldsymbol{\emptyset} \quad (\text{for all } \kappa \neq \lambda). \text{ We define subsets of economic transactions as follows:}$

(1)
$$\Omega_{\tau} \equiv \left\{ e \in \mathbb{E} \, \middle| \, \omega_e \in \omega_{\tau} \right\} ;$$

(2)
$$\mathbb{P}_{al} \equiv \left\{ e \in \mathbb{E} \, \middle| \, a_e \in \mathbb{S}_l \right\} \; ;$$

(3)
$$\mathbb{P}_{bl} \equiv \left\{ e \in \mathbb{E} \, \middle| \, b_e \in \mathbb{S}_l \right\} \; .$$

2.3 Double Entry Accounting and the Flow-of-funds Matrix

Since the currencies of the world are no longer pegged to gold either directly or indirectly, we will confine our discussion to the pure credit economy⁶. Let Φ and Λ be the stock of funds and the corresponding liabilities of the bank (i.e. pecuniary assets and liabilities); F and L be the financial assets and liabilities; and N be the nonfinancial assets respectively; all the above variables are supposed to be positive. We define net worth as the difference between the total assets and liabilities:

(4)
$$W \equiv (\Phi + F + N) - (\Lambda + L).$$

There are ten factors of changes in the balance sheet as a result of an economic transaction: $\delta \Phi_e^+$, $\delta \Phi_e^-$, $\delta \Lambda_e^+$, $\delta \Lambda_e^-$, δF_e^+ , δF_e^- , δL_e^+ , δL_e^- , δN_e^+ and δN_e^- . The superscripts + and - indicate the increasing and decreasing factor of net worth respectively so that the value represented by a variable with superscript + is positive

⁶ See Wicksell (1907).

while that with - is negative. For example, $\delta \Phi_e^+$, δF_e^+ and δN_e^+ refer to increases in the respective assets while $\delta \Phi_e^-$, δF_e^- and δN_e^- mean the decreases in the assets. However, note that, $\delta \Lambda_e^+$ and δL_e^+ refer to decreases in the respective liabilities while $\delta \Lambda_e^-$ and δL_e^- mean increases in the liabilities. We further define income and outlay in the following manner:

(5)
$$\delta I_e = \delta \Phi_e^+ + \delta N_e^- + \delta F_e^- + \delta L_e^- + \delta \Lambda_e^-;$$

(6)
$$\delta O_e = -\left(\delta \Phi_e^- + \delta N_e^+ + \delta F_e^+ + \delta L_e^+ + \delta \Lambda_e^+\right).$$

According to Goldsmith's (1948) terminology, this definition of income and outlay conforms to the earned-net-worth approach; according to Lindahl's (1933) classification, it is referred to as income as earnings. Income as earnings is defined as the total changes in net worth in relation to receipt of funds; outlay is defined as the total changes in net worth in relation to payment of funds. Since income and outlay are defined as residuals as in equations (5) and (6), the following equations hold:

(7)
$$\delta \Phi_e^+ = \delta I_e - \left(\delta N_e^- + \delta F_e^- + \delta L_e^- + \delta \Lambda_e^-\right) ;$$

(8)
$$-\delta\Phi_e^- = \delta O_e + \delta N_e^+ + \delta F_e^+ + \delta L_e^+ + \delta \Lambda_e^+$$

The above equations hold because all the entries are done twice — the payment or receipt of funds (the left-hand side of the equations) and the items exchanged for it (the right-hand side of the equations); the practice is commonly known as double entry, however in the national accounting, it is often referred to as vertical double entry to distinguish it from the aforementioned horizontal double entry.

We can sum up the income and outlay for accounting period τ , institutional sector

l, and economic transaction category K:

(9)
$$I_{\tau l \kappa} = \bigcup_{e \in \Omega_{\tau} \cap \mathbb{P}_{bl} \cap \mathbb{K}_{\kappa}} \delta I_{e} ;$$

(10)
$$O_{\tau l\kappa} = \bigcup_{e \in \Omega_{\tau} \cap \mathbb{P}_{al} \cap \mathbb{K}_{\kappa}} \delta O_{e}$$

 $I_{\tau l \kappa}$ is posted on the right-hand side of the current account; the right-hand side is customarily referred to as credit. $O_{\tau l \kappa}$ is posted on the left-hand side of the current account; the left-hand side is referred to as debit. Then we define flow variables that are recorded in the accumulation account in the similar manner:

 $\Delta F_{\tau\iota\kappa}^{-} = \bigcup_{e \in \Omega_{\tau} \cap \mathbb{P}_{h\iota} \cap \mathbb{K}_{\kappa}} \delta F_{e}^{-} ;$

 $\Delta L^{-}_{\tau\iota\kappa} = \bigcup_{e \in \Omega_{\tau} \cap \mathbb{P}_{h\iota} \cap \mathbb{K}_{\kappa}} \delta L^{-}_{e} ;$

 $\Delta N^{-}_{\tau\iota\kappa} = \bigcup_{e \in \Omega_{\tau} \cap \mathbb{P}_{h_{\tau}} \cap \mathbb{K}_{\kappa}} \delta N^{-}_{e} \quad ;$

(11)
$$\Delta \Phi_{\tau \iota \kappa}^{+} = \bigcup_{e \in \Omega_{\tau} \cap \mathbb{P}_{bl} \cap \mathbb{K}_{\kappa}} \delta \Phi_{e}^{+} ; \qquad \Delta \Phi_{\tau \iota \kappa}^{-} = \bigcup_{e \in \Omega_{\tau} \cap \mathbb{P}_{al} \cap \mathbb{K}_{\kappa}} \delta \Phi_{e}^{-} ;$$

(12)
$$\Delta F_{\tau\iota\kappa}^{+} = \bigcup_{e \in \Omega_{\tau} \cap \mathbb{P}_{al} \cap \mathbb{K}_{\kappa}} \delta F_{e}^{+} ;$$

(13)
$$\Delta L_{\tau\iota\kappa}^{+} = \bigcup_{e \in \Omega_{\tau} \cap \mathbb{P}_{al} \cap \mathbb{K}_{\kappa}} \delta L_{e}^{+} ;$$

(14)
$$\Delta N_{\tau\iota\kappa}^{+} = \bigcup_{e \in \Omega_{\tau} \cap \mathbb{P}_{a\iota} \cap \mathbb{K}_{\kappa}} \delta N_{e}^{+} ;$$

(15)
$$\Delta\Lambda_{\tau\iota\kappa}^{+} = \bigcup_{e \in \Omega_{\tau} \cap \mathbb{P}_{b\iota} \cap \mathbb{K}_{\kappa}} \delta\Lambda_{e}^{+} ; \qquad \Delta\Lambda_{\tau\iota\kappa}^{-} = \bigcup_{e \in \Omega_{\tau} \cap \mathbb{P}_{a\iota} \cap \mathbb{K}_{\kappa}} \delta\Lambda_{e}^{-} .$$

The flow variables with superscript + are posted on the left-hand side of the accumulation account; the variables with superscript – are posted on the right-hand side of the account. From equations (7) thorough (15) above, we obtain the following equations that depict the vertical double entry for accounting period τ and for non-bank institutional sector l:

(16)
$$\sum_{k} \Delta \Phi_{\tau \iota k}^{+} = \sum_{k} \left(I_{\tau \iota k} - \left(\Delta N_{\tau \iota k}^{-} + \Delta F_{\tau \iota k}^{-} + \Delta L_{\tau \iota k}^{-} \right) \right) =$$

(17)
$$-\sum_{k} \Delta \Phi_{\tau \iota k}^{-} = \sum_{k} \left(O_{\tau \iota k} + \Delta N_{\tau \iota k}^{+} + \Delta F_{\tau \iota k}^{+} + \Delta L_{\tau \iota k}^{+} \right) .$$

An increment of funds (i.e. receipt) comes either from income, such as wages and interest, or from disposing assets or incurring liabilities. A decrement of funds (i.e. payment) is a result either of outlay, such as purchase of perishable goods and payment of rent, or of acquiring assets or repaying liabilities. The corresponding equations for funds-issuing bank β are as follows:

(18)
$$\sum_{k} \Delta \Lambda^{+}_{\tau\beta k} = \sum_{k} \left(I_{\tau\beta k} - \left(\Delta N^{-}_{\tau\beta k} + \Delta F^{-}_{\tau\beta k} + \Delta L^{-}_{\tau\beta k} \right) \right) ;$$

(19)
$$-\sum_{k} \Delta \Lambda_{\tau\beta k}^{-} = \sum_{k} \left(O_{\tau\beta k} + \Delta N_{\tau\beta k}^{+} + \Delta F_{\tau\beta k}^{+} + \Delta L_{\tau\beta k}^{+} \right)$$

In most cases, funds are created against financial assets and canceled upon repayment. As the result of the vertical double entry, the following equation holds for both banks and non-bank sectors:

(20)
$$\sum_{k} \left(O_{\tau \iota k} + \Delta \Phi_{\tau \iota k}^{+} + \Delta N_{\tau \iota k}^{+} + \Delta F_{\tau \iota k}^{+} + \Delta L_{\tau \iota k}^{+} + \Delta \Lambda_{\tau \iota k}^{+} \right)$$
$$= \sum_{k} \left(I_{\tau \iota k} - \left(\Delta \Phi_{\tau \iota k}^{-} + \Delta N_{\tau \iota k}^{-} + \Delta F_{\tau \iota k}^{-} + \Delta L_{\tau \iota k}^{-} + \Delta \Lambda_{\tau \iota k}^{-} \right) \right)$$

Therefore in the flow account, which combines current and accumulation accounts, the sum of the left-hand side is equivalent to the total of the right-hand side. Apparently, in equation (20), $\Delta \Lambda^+_{\tau tk}$ and $\Delta \Lambda^-_{\tau tk}$ apply only to the banking sectors.

In the national accounting, we can sum up the funds that is transferred from institutional sector l to η in the following manner:

(21)
$$\Phi_{\tau \iota \eta} = \bigcup_{e \in \Omega_{\tau} \cap \left(\mathbb{P}_{a\iota} \cap \mathbb{P}_{b\eta}\right)} \delta \Phi_{e}^{+} = -\bigcup_{e \in \Omega_{\tau} \cap \left(\mathbb{P}_{a\iota} \cap \mathbb{P}_{b\eta}\right)} \delta \Phi_{e}^{-}$$

We can construct a flow-of-funds matrix by posting it in the intersection of row l and column η . Please note that

(22)
$$\bigcup_{e \in \Omega_{\tau} \cap \mathbb{P}_{bl}} \delta \Phi_{e}^{+} + \bigcup_{e \in \Omega_{\tau} \cap \mathbb{P}_{al}} \delta \Phi_{e}^{-} \neq 0$$

because there can be a gap between payment and receipt of funds for a sector during an accounting period.

3. Indirect Method of making Flow-of-funds Matrix

It is well known that there are two methods of preparing cash flow statements in the business accounting: direct method and indirect method. While the former directly records the receipts and payments of funds, the latter uses profit-and-loss statement and the changes between the opening and closing balance sheets as a starting point and makes adjustments for all transactions to extract necessary information. The indirect method is more popular among business accountants because it is suitable to analyze the causes of the changes in the amount of cash at hand. Likewise, in the flow-of-funds based national accounting, the information included in the right-hand sides of equations (16) and (17) is useful to know the reason why the stock of funds has increased or decreased. Moreover, in the national accounting, the information helps to infer from whom the funds have come and to whom the funds are paid. The indirect methods for national accounting, which allows the transformation of T-shaped accounts into a matrix format, were proposed independently by Stone (1966) and Klein (1983). The two methods resembles each other, however, while the Stone formula uses the right hand side (credit and liability) of the Taccounts as its basis, the Klein formula uses the left hand side (debit and asset) as its base. The formulas apply to both the flow and stock accounts. For example, Tsujimura and Tsujimura (2011) used Stone formula to depict the negative consequences of the home mortgage delinquencies during the U.S. subprime mortgage crisis. As Tsujimura and Mizoshita (2003) and Tsujimura and Tsujimura (2010) demonstrated it using financial balance sheet, the Stone and Klein formulas can be used as a pair because the two methods are symmetrical in mathematical operation.

The first step of transferring T-accounts into a flow-of-funds matrix is to pick out the vectors of the left and right-hand sides of each sector's account, which exclude funds and the corresponding liabilities of the bank, in order to construct two $n \times m$ matrices; *n* and *m* are the number of transaction categories and institutional sectors. Since the left-hand side relates to the employment of funds while the right-hand side to the raising of funds, we will refer to the matrices as **E** and **R** respectively. While matrix **E** corresponds to the right-hand sides of equations (17) and (19), matrix **R** corresponds to those of (16) and (18). We further define diagonal matrices $\hat{\mathbf{T}}$, $\hat{\mathbf{T}}^{E}$, $\hat{\mathbf{T}}^{R}$; and vectors $\boldsymbol{\varepsilon}$ and $\boldsymbol{\rho}$. $\hat{\mathbf{T}}$ is a $m \times m$ matrix with t_i as its diagonal elements and zeros elsewhere. Likewise, $\hat{\mathbf{T}}^{E}$ and $\hat{\mathbf{T}}^{R}$ are $n \times n$ diagonal matrices with t_{k}^{E} and t_{k}^{R} as elements respectively. $\boldsymbol{\varepsilon}$ and $\boldsymbol{\rho}$ are vertical vectors of dimension *m* whose elements are $\boldsymbol{\varepsilon}_{i}$ and $\boldsymbol{\rho}_{i}$.

(23)
$$t_i = \max\left(\sum_{k=1}^n e_{ki}, \sum_{k=1}^n r_{ki}\right);$$

(24)
$$t_{k}^{E} = \sum_{i=1}^{m} e_{ki} \quad ; \quad t_{k}^{R} = \sum_{i=1}^{m} r_{ki} \quad ;$$

(25)
$$\mathcal{E}_i = t_i - \sum_{k=1}^n e_{ki} \ge 0 \; ; \quad \rho_i = t_i - \sum_{k=1}^n r_{ki} \ge 0 \; .$$

While k and l indicate transaction categories, i and j denote institutional sectors. We will use new matrices **U** and **V** to show the symmetry in the two formulas; superscripts S and K stand for the Stone and Klein formula respectively.

(26)
$$\mathbf{U}^S \equiv \mathbf{R}$$
; $\mathbf{V}^S \equiv \mathbf{E}'$;

(27)
$$\mathbf{U}^K \equiv \mathbf{E} \; ; \qquad \mathbf{V}^K \equiv \mathbf{R'} \; ;$$

the prime denotes transpose. We further define coefficient matrices \mathbf{B}^{S} , \mathbf{D}^{S} , \mathbf{B}^{K} , \mathbf{D}^{K} of the above matrices \mathbf{U}^{S} , \mathbf{V}^{S} , \mathbf{U}^{K} , \mathbf{V}^{K} by dividing each cell by the column sum:

(28)
$$\mathbf{B}^{S} = \mathbf{U}^{S} \, \hat{\mathbf{T}}^{-1} \; ; \qquad \mathbf{D}^{S} = \mathbf{V}^{S} \left(\hat{\mathbf{T}}^{E} \right)^{-1} \; ;$$

(29)
$$\mathbf{B}^{K} = \mathbf{U}^{K} \, \hat{\mathbf{T}}^{-1} ; \qquad \mathbf{D}^{K} = \mathbf{V}^{K} \left(\hat{\mathbf{T}}^{R} \right)^{-1} .$$

Then we obtain the from-whom-to-whom flow-of-funds matrices \mathbf{Y}^{S} and \mathbf{Y}^{K} , and the corresponding coefficient matrices \mathbf{C}^{S} and \mathbf{C}^{K} in the following manner:

(30)
$$\mathbf{C}^{S} = \mathbf{D}^{S} \mathbf{B}^{S} ; \qquad \mathbf{C}^{K} = \mathbf{D}^{K} \mathbf{B}^{K} ;$$

and

(31)
$$\mathbf{Y}^{S} = \mathbf{C}^{S} \hat{\mathbf{T}} ; \qquad \mathbf{Y}^{K} = \mathbf{C}^{K} \hat{\mathbf{T}} .$$

4. Integrated Macroeconomic Accounts for the United States

4.1 Conversion into Flow-of-funds Data

The Integrated Macroeconomic Accounts (IMA)⁷, the U.S. equivalent of the System of National Accounts (SNA), was developed as a response to the G20 initiative; it is an attempt to harmonize the Bureau of Economic Analysis' National Income and Product Accounts (NIPA) and the Federal Reserve Board's Financial Accounts (FA), formerly known as Flow of Funds Accounts. In the IMA, estimates are presented for the following seven institutional sectors: 1) households and the non-profit institutions serving households (NPISH), 2) non-financial non-corporate business, 3) non-financial corporate business, 4) financial business, 5) federal government, 6) state and local government, and 7) rest of the world. In the following analysis, we divide the financial business into two sectors: Federal Reserve Banks and the rest of the financial business⁸. We treat the rest of the world endogenously because a currency does not cross the border. For example, when

⁷ For the details of IMA, see Cagetti et al. (2012) and Yamashita (2013).

⁸ Most of the Fed data is available in the Financial Accounts of the United States (z.1 release). We obtained additional data from Table 9A published in the Annual Reports.

U.K. and Japanese banks settle their account in U.S. dollar they use their accounts at a U.S. bank that act as an intermediary so that the U.S. dollar denominated funds never cross the border. Each sector underlying the total economy has a full complement of accounts: the current accounts (production and distribution of income accounts), and the accumulation accounts (capital, financial, other volume changes, and revaluation accounts). Current and capital accounts statistics are based on both published and unpublished NIPA data, while the financial account statistics are based on FA data; in that sense, IMA is a product-flow and funds-flow hybrid.

There are several conceptual differences between the product-flow and funds-flow methods of national accounting. While in the product-flow method, the institutional units are defined as economic entities such as households and business establishments, in the funds-flow method, the units are legal entities such as individual persons and corporations, because the latter is more closely related to the legal status such as debtor and creditor. While product-flow method is on the accrual basis, the funds-flow method is on the cash basis because the latter record the transfer of funds at the time of the transfer. While product-flow method is on the current cost basis, the funds-flow method is on the historical cost basis because the latter record the amount of funds that has changed hands. However, the most prominent difference is that the funds-flow method excludes imputations, which are quite common in the product-flow method of national accounting. For example, households that own the dwellings they occupy are commonly treated as owners of unincorporated enterprises that produce housing services consumed by those same households and as if rents were payable; in such a case, the services are actually produced but the payment of rent is fiction rather than fact. One of the advantages of the IMA is that the corresponding imputation tables are readily available.

4.2 Transferring T-Accounts into Flow-of-funds Matrix

The first step to make flow-of-funds based national accounts and the flow-of-funds matrix from the IMA is to remove imputations from the published tables using the data available in NIPA supplemental tables 7.11 and 7.12. However, these two tables do not necessarily cover all the imputations. Consumption of fixed capital is the decline, during the course of an accounting period, in the current value of the stock of fixed assets owned and used by a producer; apparently it does not involve any actual payment. Moreover, the value of the government services, most of which are not sold in the market, are indirectly measured by the cost of inputs: compensation of employees, consumption of fixed capital, and intermediate goods and services purchased. The intra-government proceedings do not involve any payment either; purchases by general government of goods and services should be classified as final demand rather than as intermediate purchases. Before moving to the next step, we made the necessary rearrangements.

The sequence of IMA starts with gross value added, which is a balancing item defined as the difference between output and intermediate input in the framework of the input-output accounts. In order to depict the process in terms of flow of funds, we need to know the gross income and outlay of each institutional sector. Although IMA contains the information from the expenditure side, such as consumption expenditures and exports, it lacks the information to which institutional sector the payment is made. The core of the U.S. input-output accounts, which is published as a part of the Annual Industry Accounts, consists of two basic tables: the supply table and the use table. While the supply table shows the production of goods and services by industries, the use table shows the uses of the products by intermediate and final users and the components of value added. Since the supply and demand for each product is balanced in these tables, we estimated the

payment and receipt relating to intermediate input, final consumption expenditures, gross fixed capital formation and exports, using the supply and use tables. The problem is that the supply table does not show the production of goods and services by institutional sectors, such as non-financial non-corporate businesses, non-financial corporate businesses, financial businesses and NPISH. We estimated the figures for each product before aggregation using the composition of legal form of organization by industries published in the 2002 Economic Census and 2007 Census of Agriculture.

5. Structural Changes in the U.S. economy

The flow-of-funds based U.S. national accounts for 2011 that is constructed using the above procedure is shown as Table 1. Table 1-1 is the **E** matrix that depicts the employment of funds, while Table 1-2 is the **R** matrix that represents the raising of funds. Both tables consist of 8 sectors including Federal Reserve Banks and the rest of the world, and 41 economic transaction categories. These tables show the reasons behind the increment and decrement of funds for each sector. Since **E** matrix depicts the payments while **R** matrix does the corresponding receipts, the row sum of the former is equivalent to that of the latter. The total payment does not necessarily match the total receipt of the sector so that the difference is posted as ε_i and ρ_i at the second row from the bottom; as equations (23) and (25) imply, $\varepsilon_i > 0$ and $\rho_i = 0$ if total receipt is larger than total payment, while $\rho_i > 0$ and $\varepsilon_i = 0$ if total payment is larger than total receipt. For the non-bank sectors, ε_i is the amount of funds put aside either for future use or for repayment; ρ_i is the amount of funds either withdrew from deposit or newly created. For the funds-issuing banks, \mathcal{E}_i corresponds to net cancellation of funds and ρ_i to net creation of funds. The following matrix expression might make the meaning of \mathcal{E}_i and ρ_i clearer.

The flow-of-funds matrix \mathbf{Y}^{S} for 2011 derived from \mathbf{E} and \mathbf{R} matrices are shown in Table 2. While the row sectors are payers, the column sectors are payees. The Stone formula rather than Klein formula is used here because the former is from-whom-to-whom presentation while the latter is to-whom-from-whom; since $\hat{\mathbf{T}}^{E} = \hat{\mathbf{T}}^{R}$ as mentioned above, $\mathbf{Y}^{K} = (\mathbf{Y}^{S})'$. In the Stone formula, $\boldsymbol{\varepsilon}$ is a column vector while $\boldsymbol{\rho}'$ is a row vector; in the Klein formula, $\boldsymbol{\rho}$ is a column vector while $\boldsymbol{\varepsilon}'$ is a row vector as shown in Appendix A(2) and A(3) to Tsujimura and Mizoshita (2003). The fundamental equation for the Klein formula is as follows:

$$\mathbf{C}^{K}\mathbf{t}+\boldsymbol{\rho}=\mathbf{t};$$

where $\mathbf{t} = \hat{\mathbf{T}}\mathbf{i}$, and \mathbf{i} is the column unit vector. The equilibrium equation is in the following form:

(33)
$$\mathbf{t} = \left(\mathbf{I} - \mathbf{C}^{K}\right)^{-1} \boldsymbol{\rho} \quad .$$

Therefore, the changes in the volume of economic transactions \mathbf{t} can be decomposed into two components: the changes in vector $\boldsymbol{\rho}$ and in the Leontief inverse $(\mathbf{I} - \mathbf{C}^{K})^{-1}$. However, since $\boldsymbol{\rho} = \mathbf{t} - \mathbf{Y}^{K}\mathbf{i}$ and $\boldsymbol{\varepsilon} = \mathbf{t} - \mathbf{Y}^{K'}\mathbf{i}$,

(34)
$$\mathbf{i'}\boldsymbol{\rho} = \mathbf{i'}\mathbf{t} - \mathbf{i'}\mathbf{Y}^{K}\mathbf{i} = \mathbf{i'}\mathbf{t} - \mathbf{i'}\mathbf{Y}^{K'}\mathbf{i} = \mathbf{i'}\boldsymbol{\epsilon}$$

That is to say ρ and the Leontief inverse are by no means mutually independent so that

we used the decomposition method recommended by Dietzenbacher and Los (2000).

Let $\hat{\mathbf{R}}^{K}$ be a $m \times m$ matrix, with $C_{\mathcal{E}i}^{K}$ as its diagonal elements and zeros elsewhere, and $\mathbf{Q}^{K} = \mathbf{C}^{K} \left(\mathbf{I} - \hat{\mathbf{R}}^{K}\right)^{-1}$ so that equation (33) can be rewritten as follows: (35) $\mathbf{t} = \left(\mathbf{I} - \mathbf{Q}^{K} \left(\mathbf{I} - \hat{\mathbf{R}}^{K}\right)\right)^{-1} \boldsymbol{\rho}$.

Then the equation could be decomposed into two components: the payment portfolio
$$\mathbf{Q}^{K}$$
 and the difference between the payment and receipt of funds $\mathbf{\rho}$ and $\mathbf{\varepsilon}$; the latter is represented in $\hat{\mathbf{R}}^{K}$ in equation (35). The decomposition is as in the following equation⁹:

$$(36) \quad \mathbf{t}_{\tau} - \mathbf{t}_{\tau-1} = \left(\mathbf{I} - \mathbf{Q}_{\tau}^{K}\left(\mathbf{I} - \hat{\mathbf{R}}_{\tau}^{K}\right)\right)^{-1} \boldsymbol{\rho}_{\tau} - \left(\mathbf{I} - \mathbf{Q}_{\tau-1}^{K}\left(\mathbf{I} - \hat{\mathbf{R}}_{\tau-1}^{K}\right)\right)^{-1} \boldsymbol{\rho}_{\tau-1}$$

$$= \frac{1}{2} \left\{ \left(\mathbf{I} - \mathbf{Q}_{\tau}^{K}\left(\mathbf{I} - \hat{\mathbf{R}}_{\tau}^{K}\right)\right)^{-1} \boldsymbol{\rho}_{\tau} - \left(\mathbf{I} - \mathbf{Q}_{\tau-1}^{K}\left(\mathbf{I} - \hat{\mathbf{R}}_{\tau}^{K}\right)\right)^{-1} \boldsymbol{\rho}_{\tau} \right\}$$

$$+ \frac{1}{2} \left\{ \left(\mathbf{I} - \mathbf{Q}_{\tau}^{K}\left(\mathbf{I} - \hat{\mathbf{R}}_{\tau-1}^{K}\right)\right)^{-1} \boldsymbol{\rho}_{\tau-1} - \left(\mathbf{I} - \mathbf{Q}_{\tau-1}^{K}\left(\mathbf{I} - \hat{\mathbf{R}}_{\tau-1}^{K}\right)\right)^{-1} \boldsymbol{\rho}_{\tau-1} \right\}$$

$$+ \frac{1}{2} \left\{ \left(\mathbf{I} - \mathbf{Q}_{\tau}^{K}\left(\mathbf{I} - \hat{\mathbf{R}}_{\tau}^{K}\right)\right)^{-1} \boldsymbol{\rho}_{\tau} - \left(\mathbf{I} - \mathbf{Q}_{\tau}^{K}\left(\mathbf{I} - \hat{\mathbf{R}}_{\tau-1}^{K}\right)\right)^{-1} \boldsymbol{\rho}_{\tau-1} \right\}$$

$$+ \frac{1}{2} \left\{ \left(\mathbf{I} - \mathbf{Q}_{\tau-1}^{K}\left(\mathbf{I} - \hat{\mathbf{R}}_{\tau}^{K}\right)\right)^{-1} \boldsymbol{\rho}_{\tau} - \left(\mathbf{I} - \mathbf{Q}_{\tau-1}^{K}\left(\mathbf{I} - \hat{\mathbf{R}}_{\tau-1}^{K}\right)\right)^{-1} \boldsymbol{\rho}_{\tau-1} \right\}$$

Figure 1 shows that the changes in both surplus and deficit of funds represented by vectors $\mathbf{\rho}$ and $\mathbf{\epsilon}$, and the economic structure depicted as payment portfolio \mathbf{Q}^{K} significantly affected the total volume of economic transactions $\mathbf{i't}$ before, during and after the

⁹ The detailed comparison of the alternative decomposition methods is found in Dietzenbacher and Los (1998).

subprime mortgage crisis that hit the U.S. economy in 2008 and 2009. Although ρ and ϵ are playing the dominant role in either increasing or decreasing the total volume of economic transactions, we cannot overlook the importance of the structural changes in the payment portfolio. For example, in 2008, the changes in the payment portfolio Q^{K} apparently caused the downslide of the economy. In contrast to this, in 2010, payment portfolio structure worked positively stopping the further downfall of the economy despite the deficiency in supply of funds.

The annual changes in ρ_i , the each cell of vector $\mathbf{\rho}$, is depicted in Figure 2. It is apparent that ρ_i of the households fluctuated wildly during the years between 2007 and 2010. It increased substantially in 2007 reflecting the vigorous consumer spending and borrowing at the end of the housing bubble. In contrast to this, in 2008, ρ_i of the households decreased sharply suggesting that the consumers began to cut down their expenditure most probably as a result of the credit squeeze. Another finding is that the Federal Reserve Banks increased the supply of funds in 2009 but reversed its attitude in 2010. Figure 3 shows the changes in $C_{\mathcal{E}i}^{K}$ that is the elements of diagonal matrix $\hat{\mathbf{R}}^{K}$. Obviously, $C_{\mathcal{E}i}^{K}$ of the Federal Reserve Banks increased steeply in 2007 indicating that the cancellation surpassed creation of funds; the policy tightening surely triggered the downfall of the economy. Although the Fed reversed its policy in 2008, it was too late and could not prevent the financial crisis.

As shown in Figure 1, the economic structure reflected in payment portfolio \mathbf{Q}^{K} also played a decisive role during the subprime mortgage crisis. The changes in the intertemporal correlation coefficient

(37)
$$\boldsymbol{\varphi}_{i\tau\tau-1} = \frac{n \cdot \mathbf{q}_{i\tau}^{K'} \mathbf{q}_{i\tau-1}^{K} - \left(\mathbf{i'} \mathbf{q}_{i\tau}^{K}\right) \left(\mathbf{i'} \mathbf{q}_{i\tau-1}^{K}\right)}{\sqrt{n \cdot \mathbf{q}_{i\tau\tau}^{K'} \mathbf{q}_{i\tau}^{K} - \left(\mathbf{i'} \mathbf{q}_{i\tau}^{K}\right)^{2}} \sqrt{n \cdot \mathbf{q}_{i\tau-1}^{K'} \mathbf{q}_{i\tau-1}^{K} - \left(\mathbf{i'} \mathbf{q}_{i\tau-1}^{K}\right)^{2}} ,$$

where $\mathbf{q}_{i\tau}^{K} = \mathbf{Q}_{\tau}^{K} \mathbf{e}_{i}$ (\mathbf{e}_{i} is a vector with 1 as i th element and 0 elsewhere), is shown as Figure 1-4. It is apparent that the coefficient for all sectors but the Federal Reserve Banks stayed around 1 suggesting that the payment portfolio structure was invariable throughout the observation period 1998-2011. Meanwhile, the correlation coefficient of the Federal Reserve Banks fluctuated widely between 0 and 1 throughout the duration indicating the changes in the policy stance. The coefficient significantly diverted from 1 during the years between 1999 and 2002, and then between 2007 and 2010. As depicted in Figure 1, the portfolio changes affected the economy sometimes positively but in other times negatively.

6. Concluding Remarks

To put it into one sentence, the conclusion of the above analysis is that the economy is more susceptible to monetary policies than we have ever suspected. Bernanke (2009), then the chairman of the Fed, asserted that there is a conspicuous difference between the quantitative easing and credit easing policies. According to his description, in a pure quantitative-easing regime, the focus of policy is the quantity of bank reserves, which are liabilities of the central bank; the composition of loans and securities on the asset side of the central bank's balance sheet is incidental. In contrast, he argued that, credit easing approach focuses on the mix of loans and securities that it holds and on how this composition of assets affects credit conditions for households and businesses. Since Klein formula focuses on the asset side of portfolio, the asset composition \mathbf{Q}^{K} is directly reflected in the Leontief inverse. However, the liability side of the portfolio is not directly taken into account; rather the amount of the creation of funds (i.e. bank reserves) is represented in vector \mathbf{p} . The performance of the macro economy as well as of each sector in terms of the volume of economic transactions is determined as the product of the inverse matrix and the vector. Although the actual policy is the mixture of the two, at least theoretically we can distinguish the two factors, net creation of funds and the corresponding asset portfolio, by means of structural decomposition; it will simplify the policy making process.

The problem is that the indirect method of making from-whom-to-whom flow-offunds matrix is cumbersome and sometimes erroneous because the Stone and Klein formulas assume that the funds are allocated according to the existing portfolio; the portfolio data are updated every three months at best. On the other side of the Atlantic, bank debit cards — instruction devices for funds transfer — are the most favored means of payment by the Europeans today. The recently established Single Euro Payments Area (SEPA) is where all the citizens, businesses and public authorities can make and receive payments regardless of the nature of transaction; similar systems are at work for some time in the U.S., Japan and several other countries. The payment statistics, which is an indispensable data source for flow-of-funds based national accounting alongside the balance sheets, will accumulate sooner or later if people wish to do so. It will allow us to directly make flow-of-funds matrix using the procedure described as equation (21). One of the advantages of the payment statistics is the accuracy; as far as the transfer of funds through networks is concerned, every penny is counted. Another advantage is the immediate availability of the statistics; since the data is collected at the time of payment, there is no delay in reporting. An addition of transaction category

numbers to the source data will make it possible to compile flow-of-funds based national accounts automatically direct from the payment statistics. Although GDP is not a concept based on the funds-flow method of national accounting, the payment statistics will surely contribute to the speed and accuracy of the preliminary estimation of the figure as well.

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Figure 1. Changes and decomposition of the total volume of U.S. economic transactions



Figure 2. Changes in vector ρ



Note) The figures for Households and NPISH, non-financial non-corporate business and state and local governments are zero throughout the observation period.





Figure 4. Intertemporal correlation coefficient of \mathbf{Q}^{K}

		1	2	3	4	5	6	7	8	
		Households and NPISH	Non-financial non- corporate business	Non-financial corporate business	Federal government	State and local governments	Rest of the world	Financial business	Federal Reserve Banks	Total (t ^E)
1	Intermediate input	61	1276	8057	14	0	0	1051	1	10460
2	Final consumption expenditures of households	9422	0	0	0	0	0	0	0	9422
3	Final consumption expenditures of federal government	0	0	0	469	0	0	0	0	469
4	Final consumption expenditures of state and local government	0	0	0	0	664	0	0	0	664
5	Exports	0	0	0	0	0	1712	0	0	1712
6	Compensation of employees	737	787	4473	511	1155	6	611	2	8282
7	Taxes on production and imports less subsidies	0	185	689	51	0	0	66	0	990
8	Interest	642	301	445	312	121	132	545	4	2501
9	Dividends	0	0	548	0	0	285	326	2	1160
10	Withdrawals from income of quasi-corporations	0	1185	0	0	0	0	90	0	1276
11	Rents of land and natural resources	0	0	18	0	0	0	0	0	18
12	Current and capital taxes on income, wealth, etc.	1560	0	245	0	0	0	131	0	1936
13	Social benefits/contributions	916	0	0	1746	536	0	0	0	3198
14	Other current transfers	138	21	78	476	0	0	16	0	728
15	Capital transfers	0	0	0	124	0	0	0	0	124
16	Gross fixed capital formation (residential)	483	0	0	0	0	0	0	0	483
17	Gross fixed capital formation (non residential)	562	869	0	0	0	0	0	0	1430
18	Public gross fixed capital formation	0	0	0	226	259	0	0	0	486
19	Acquisition of nonproduced nonfinancial assets	0	0	0	0	12	0	0	0	12
20	Open market paper	0	0	0	0	24	54	68	0	146
21	Treasury securities	0	1	0	0	0	412	327	642	1382
22	Agency- and GSE-backed securities	13	0	0	0	0	0	377	0	390
23	Municipal securities	8	0	0	0	54	0	16	0	77
24	Corporate and foreign bonds	53	0	0	0	0	0	491	0	544
25	Short term loans	43	0	2	89	0	67	234	0	435
26	Long term loans (mortgages)	235	44	57	4	0	0	0	0	339
27	Corporate equities	0	0	472	40	0	0	0	0	513
28	Mutual fund shares	193	0	0	0	0	147	13	0	353
29	Money market fund shares	11	1	0	0	0	0	113	0	124
30	Equity in noncorporate business	0	1	0	0	0	0	2	0	9
31	Equity in government-sponsored enterprises	0	0	0	0	0	0	6	0	6
32	Investment in subsidiaries	0	0	9	0	0	0	104	0	112
33	US direct investment abroad	0	0	397	0	0	0	23	0	419
34	Foreign direct investment in US	0	0	0	0	0	234	0	0	234
30	Stock in Federal Reserve banks	0	0	0	0	0	0	0	0	0
36	Equity in international organizations	0	0	0	3	0	0	0	0	3
3/	Net equity in life insurance reserves	8/	0	0	0	0	0	0	0	8/
38	Net equity in pension fund reserves	264	0	0	0	0	0	0	0	264
39	Insurance technical reserves other than life insurance/pension fund	28	6	16	0	0	0	14	0	10
40	Equity in Retiree Health Gare Funds	19	0	0	0	0	0	71	0	71
41	Nonmarketable government securities	0	0	2745	0	0	145	/1	0	/1
-	8	15470	4600	3/45	4101	0	145	484	640	
L	Iotal (t)	104/2	4083	19249	41Z1	2024	2193	51/8	049	

Table 1-1. E matrix for the United States 2011 (Billions of US Dollar)

	1	2	3	4	5	6	7	8	
	Households and NPISH	Nonfinancial Noncorporate Business	Nonfinancial Corporate Business	Federal Government	State and Local Governments	Rest of the World	Financial Business	Monetary Authority	Total (t ^R)
1 Intermediate input	13	1162	7069	0	0	1161	1055	1	10460
2 Final consumption expenditures of households	37	1502	6794	0	0	465	625	0	9422
3 Final consumption expenditures of federal government	0	41	380	0	0	43	4	0	469
4 Final consumption expenditures of state and local government	2	76	534	0	0	46	7	0	664
5 Exports	0	154	1478	0	0	0	79	0	1712
6 Compensation of employees	8268	0	0	0	0	14	0	0	8282
7 Taxes on production and imports less subsidies	0	0	0	0	990	0	0	0	990
8 Interest	28	0	155	302	205	98	1629	85	2501
9 Dividends	676	0	138	0	2	136	208	0	1160
10 Withdrawals from income of quasi-corporations	1276	0	0	0	0	0	0	0	1276
11 Rents of land and natural resources	0	0	0	6	11	0	0	0	18
12 Current and capital taxes on income, wealth, etc.	0	0	0	1561	375	0	0	0	1936
13 Social benefits/contributions	2274	0	0	906	18	0	0	0	3198
14 Other current transfers	46	0	0	70	613	0	0	0	728
15 Capital transfers	12	2	6	0	69	2	32	0	124
16 Gross fixed capital formation (residential)	0	63	413	0	0	8	0	0	483
17 Gross fixed capital formation (non residential)	0	142	1055	0	0	227	6	0	1430
18 Public gross fixed capital formation	0	52	381	0	0	51	1	0	486
19 Acquisition of nonproduced nonfinancial assets	9	0	2	0	0	0	0	0	12
20 Open market paper	3	0	33	0	0	0	110	0	146
21 Treasury securities	257	0	5	1067	53	0	0	0	1382
22 Agency- and GSE-backed securities	0	0	2	119	47	24	0	198	390
23 Municipal securities	66	0	10	0	0	1	0	0	77
24 Corporate and foreign bonds	0	0	411	0	7	126	0	0	544
25 Short term loans	2	57	129	0	9	130	0	108	435
26 Long term loans (mortgages)	11	0	0	0	7	0	322	0	339
27 Corporate equities	123	0	0	0	7	188	169	26	513
28 Mutual fund shares	0	0	13	0	2	0	338	0	353
29 Money market fund shares	0	0	35	0	3	21	65	0	124
30 Equity in noncorporate business	9	0	0	0	0	0	0	0	9
31 Equity in government-sponsored enterprises	0	0	0	0	0	0	6	0	6
32 Investment in subsidiaries	0	0	0	0	0	31	82	0	112
33 US direct investment abroad	0	0	0	0	0	419	0	0	419
34 Foreign direct investment in US	0	0	207	0	0	0	2/	0	234
35 Stock in Federal Reserve banks	0	0	0	0	0	0	0	0	0
36 Equity in international organizations	0	0	0	0	0	3	0	0	3
37 Net equity in life insurance reserves	0	0	0	0	0	0	8/	0	8/
38 Net equity in pension fund reserves	0	0	0	0	0	0	264	0	264
39 Insurance technical reserves other than life insurance/pension fund	0	0	0	0	0	0	64	0	64
4U Equity in Retiree Health Care Funds	0	0	0	19	0	0	0	0	19
4 I Nonmarketable government securities	0	0	0	/1	0	0	0	0	/1
	2361	1432	10040	0	405	0	U	232	
lotal (t)	154/2	4083	19249	4121	2824	3193	51/8	649	

Table 1-2. **R** matrix for the United States 2011 (Billions of US Dollar)

Table 2. \mathbf{Y}^{S} matrix for the United States 2011 (Billions of US Dollar)

i i	1	2	3	5	6	7	4	8		
	Households and NPISH	Non- financial non- corporate business	Non- financial corporate business	Federal government	State and local government s	Rest of the world	Financial business	Federal Reserve Banks	ε	Total
1 Households and NPISH	1454	1633	7766	1630	485	622	1843	39	0	15472
2 Non-financial non-corporate business	1986	228	1522	39	228	293	376	10	0	4683
3 Non-financial corporate business	4920	895	5538	266	858	1557	1431	41	3745	19249
4 Federal government	1808	81	620	578	559	127	259	35	56	4121
5 State and local governments	1592	104	760	167	13	81	104	4	0	2824
6 Rest of the world	252	163	1766	334	30	59	425	21	145	3193
7 Financial business	977	147	1275	612	222	455	737	268	484	5178
8 Federal Reserve Banks	122	0	3	496	25	0	3	0	0	649
ρ	2361	1432	0	0	405	0	0	232		
Total	15472	4683	19249	4121	2824	3193	5178	649		